

# Notice of Allowability

Application No.

10/691,903

Examiner

Lawrence B. Williams

Applicant(s)

HWANG ET AL.

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to after final amendment filed on 24 October 2007.
2. ☒ The allowed claim(s) is/are 1-2, 4-16, 18-20, renumbered as 1-2, 3-15, 16-18, respectively.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

- |  |   |
|--|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application                     |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____ |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____    | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                   |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance  |
|  | 9. <input type="checkbox"/> Other _____   |

**TERMINAL DISCLAIMER**

1. The terminal disclaimer filed on 24 October 2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of 10/692,896 has been reviewed and is accepted. The terminal disclaimer has been recorded.

### REASONS FOR ALLOWANCE

1. The following is an examiner's statement of reasons for allowance: The instant application discloses an apparatus for transmission antenna diversity. A search of prior art records has failed to teach or suggest, alone or in combination:

“ a transmitter for transmitting complex symbols in a wireless communication system, comprising: three transmission antennas; and an encoder ensuring maximum diversity by grouping N input symbols into N combinations each including three symbols by applying negative and conjugate to the symbols so that the N input symbols are transmitted only once from each antenna and at each time interval, and delivering the N combinations to the three transmission antennas for N time intervals; wherein at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values” as disclosed in claim 1.

“ a receiver for receiving complex symbols in a wireless communication system, comprising: a symbol arranger for receiving signals received via at least one reception antenna from three transmission antennas, for four time intervals, the symbol arranger forming a matrix via at least one reception antenna from the symbol arranger forming a matrix by collecting the signals received via the at least one reception antenna, where signals received via one reception antenna are arranged in one row, and signals received via another reception antenna are arranged in another row; a channel estimator for receiving signals via the at least one reception antenna, and estimating three channel gains representing channel gains from the three transmission antennas to the at least one reception antenna; first and second decoders for calculating metric values for all possible sub-combinations each including two symbols by using the channel gains received from the channel estimator and the signals received by the symbol arranger, and

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detecting two symbols having a minimum metric value; and a parallel-to-serial converter for sequentially arranging two symbols detected by the first and second decoders” as disclosed in claim 12.

“a receiver for receiving complex symbols in a wireless communication system, comprising: a symbol arranger for receiving signals received via at least one reception antenna from three transmission antennas, for three time intervals, the symbol arranger forming a matrix by collecting the signals received via the at least one reception antenna, where signals received via one reception antenna are arranged in one row, and signals received via another reception antenna are arranged in another row; a channel estimator for receiving signals via the at least one reception antenna, and estimating three channel gains representing channel gains from the three transmission antennas to the at least one reception antenna; and a decoder for calculating metric values for all possible symbol combinations each including three symbols by using the channel gains received from the channel estimator and the signals received by the symbol arranger, and detecting three symbols having a minimum metric value comprising: a symbol generator for generating all possible symbol combinations each including three symbols; two phase rotators for phase-rotating two symbols selected from the three symbols by predetermined phase values  $(\theta_1, \theta_2)$ ; a metric calculator for calculating metric values for symbol combinations including the phase-rotated symbols with the signals received by the symbol arranger and the channel gains; and a detector for detecting three symbols having a minimum metric value by using the calculated metric value” as disclosed in claim 16.

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“a transmitter for transmitting complex symbols in a wireless communication system, comprising: M transmission antennas; and an encoder ensuring maximum diversity by grouping N input symbols into N combinations each including M symbols by applying negative and conjugate to the symbols so that the N input symbols are transmitted only once from each antenna and at each time interval, and delivering the N combinations to the M transmission antennas for N time intervals; wherein at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values” as disclosed in claim 19.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

### CONCLUSION

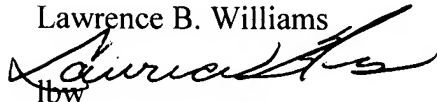
2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037. The examiner can normally be reached on Monday-Friday (8:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ghayour Mohammad can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lawrence B. Williams



lbw  
November 2, 2007



MOHAMMED GHAYOUR  
SUPERVISORY PATENT EXAMINER